Award Number: W81XWH-11-1-0367

TITLE: Analysis of Novel Prostate Cancer Biomarkers and their Predictive Utility in an Active Surveillance Protocol

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CONTRACTING ORGANIZATION: Massachusetts General Hospital
Boston, MA 02114

REPORT DATE: May 2015

TYPE OF REPORT: Annual Summary

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
May 2015	Annual Summary	1 May 2014 – 30 April 2015

4. TITLE AND SUBTITLE

Analysis of Novel Prostate Cancer Biomarkers and their Predictive Utility in an Active Surveillance Protocol

5a. CONTRACT NUMBER

5b. GRANT NUMBER
W81XWH-11-1-0367

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
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5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public Release; Distribution Unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The Research Project supported by this DOD PCRP Physician Research Training Award investigates novel biomarkers for prostate cancer detection and the investigation of biomarkers in active surveillance. This report summarizes the research and accomplishments in the fourth year of this award. In this year, I have had continued success in investigating potential proteomic prostate cancer biomarkers. In addition, we have begun to investigate metabolomic signatures in prostate cancer in urine and tissue. I also have continued my clinical investigation of men with prostate cancer on active surveillance. We published a manuscript on our cohort series and have presented at national meetings our updated investigations on young men on active surveillance for low risk prostate cancer.

15. SUBJECT TERMS
Nothing listed

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			USAMRMC
U	U	U	UU	31	19b. TELEPHONE NUMBER *(include area code)*

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Introduction:

The Research Project supported by this DOD PCRP Physician Research Training Award investigates novel biomarkers for prostate cancer detection and the investigation of biomarkers in active surveillance. The goals and objectives of this study are summarized by the Specific Aims: 1. Evaluate the relative levels of expression of our panel of candidate protein biomarkers in urine, tissue and serum from patients with prostate cancer compared with normal controls to identify prostate cancer specific biomarkers. 2. Evaluate the relative urine, tissue and serum levels of these prostate cancer specific biomarkers within our entire active surveillance (AS) cohort to identify accurate biomarkers predictive of indolent vs. progressive prostate cancer. The funding from this Physician Research Training Award provides salary support for Dr. Adam S. Feldman to secure protected time as a translational and clinical investigator in prostate cancer research. It also provides salary support for a Research Assistant for this research.

Body:

The first year of my DOD PCRP PRTA was very productive from both a translational laboratory and clinical research standpoint. In summation, I used mass spectrometry (MS) to quantitatively compare the entire urinary proteome and identify differentially expressed proteins in the urine from men with prostate cancer as compared with those found in controls. The MS analysis identified >1400 unique proteins, comparative analysis revealed 55 potential prostate cancer specific proteins, and using bioinformatic database analyses, we narrowed this list to 20 biologically relevant proteins. Using semi-quantitative Western blot, we investigated several proteins on the list of 20 relevant proteins including Leukocyte Elastase Inhibitor, Annexin A1, Plastin-2, Vimentin, and Tissue Inhibitor of Matrix Metalloproteinase Type 1 (TIMP-1). We used urine specimens of 56 men, both from PrCA and Controls. These urine specimens were selected from our urine biospecimen bank, prospectively obtained and developed from our urologic oncology clinic at Massachusetts General Hospital. In TIMP-1, we found a significant difference in TIMP-1 expression between men with Gleason 3+3 disease and men with Gleason 7 or greater.

In the second year of my DOD PCRP PRTA, I further explored the compelling data from the TIMP-1 Western blots and returned to my original list of 55 differentially expressed potential prostate cancer specific proteins to assess other possible candidate markers. Looking at TIMP-1, we used Enzyme-Linked Immunosorbent Assays (ELISA) and Immunohistochemistry (IHC) to corroborate the data we found in Western blot analyses. Using IHC, we were able to show increased staining for Gleason 8 or higher, compared to lower Gleason scores supporting our previous Western blot data and further pointing to the potential of TIMP-1 as a relevant biomarker for prostate cancer. For ELISA analysis of TIMP-1 expression we used the same cohort of 56 men, both PrCA and Controls, as analyzed by Western blot. Although we demonstrated differential expression across our cohort, we were unable to effectively reproduce the results we found in Western blot. This discrepancy between Western blot and ELISA results were consistent across two separate commercially available ELISA kits (R&D Systems, Mineapolis, MN and EMD Millipore, Billerica, MA), suggesting that possibly the Western blot antibodies and

ELISA antibodies were measuring separate epitopes and therefore demonstrating different results. In my second year we also returned to my original list of 55 differentially expressed potential prostate cancer specific proteins, using both Western blot and ELISA analyses with several representative specimens as an initial evaluation to screen for those proteins with potential clinical relevance.

In the third year of my DOD PCRP PRTA, I pursued the promising Western blot candidates from year two, including Semenogelin-2, Lactoylglutathione Lyase, Hepsin, Alpha-1-Antichymotrypsin (SerpinA3), and Growth-Inhibiting Protein 12 (GIP 12). We also investigated the protein candidates Prohibitin, Radixin, Taldo1, Fructose-Bisphosphate Aldolase A, Lactate Dehydrogenase A, CD63, Cytochrome C, Ras-related protein RAB-3A, Macrophage Capping Protein, 10kd Heat Shock Protein, Annexin A3, Sorbitol Dehydrogenase, Fibrinogen Beta Chain Precursor, and Creatine Kinase B-Type. We further investigated other biologically relevant candidates including Annexin A1, Cystatin B, and AZI. These additional protein candidate markers unfortunately did not demonstrate promising results by extensive Western Blot evaluation. We also pursued ELISA analysis of biologically relevant and promising candidates Prohibitin, 10kd Heat Shock Protein, and Growth-Inhibiting Protein 12 (GIP 12), however, did not identify clear differences in expression between clinical disease states. One protein, however, that continued to show promise, in addition to TIMP-1, was Semenogelin II. Semenogelin II is a protein that normally participates in the formation of the seminal coagulum. A handful of publications in the literature have suggested involvement of the semenogelin proteins in prostate cancer.

In this past fourth year of my DOD PCRP PRTA, I have continued to further investigate potential proteins as urinary biomarkers for prostate cancer. I further analyzed the viability of Semenogelin II as a potential prostate cancer biomarker, as we had promising preliminary data by Western Blot analysis in year three. To investigate this marker we used urine specimens of 54 men, both from men with PrCA and biopsy negative controls. These urine specimens were selected from our urine biospecimen bank, prospectively obtained and developed from our urologic oncology clinic at Massachusetts General Hospital. We tested two commercially available antibodies for Western Blot of Semenogelin II (Santa Cruz Biotechnology, Inc. and Sigma Aldrich) and optimized our Western blot protocol for the Santa Cruz antibody for more accurate characterization of expression.

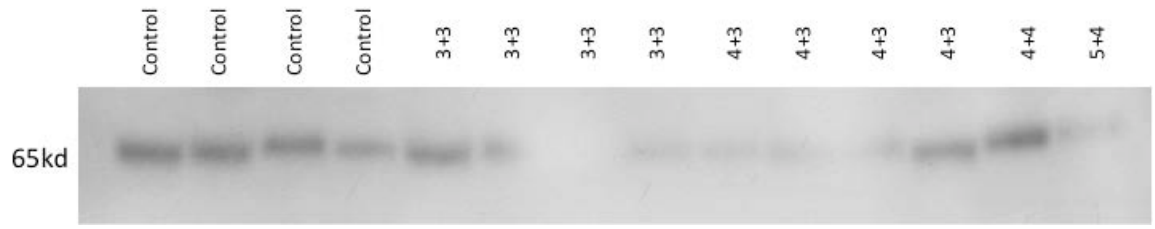


Figure 1: Representative Western blot analysis of urinary expression of Semenogelin II (65kd)

Figure 1 shows a representative Western Blot demonstrating the expression of Semenogelin II in protein isolated from urine specimens obtained from men with prostate cancer and normal controls. This image suggests that while there is differential

expression observed between patients, there is no clear trend between control and cancer, or within cancer grades. Our overall analysis of Western blot expression data confirmed that while we saw variable expression among patients, we unfortunately found no clear definable trend. Figure 2 demonstrates the Western blot results for all 54 patients. This

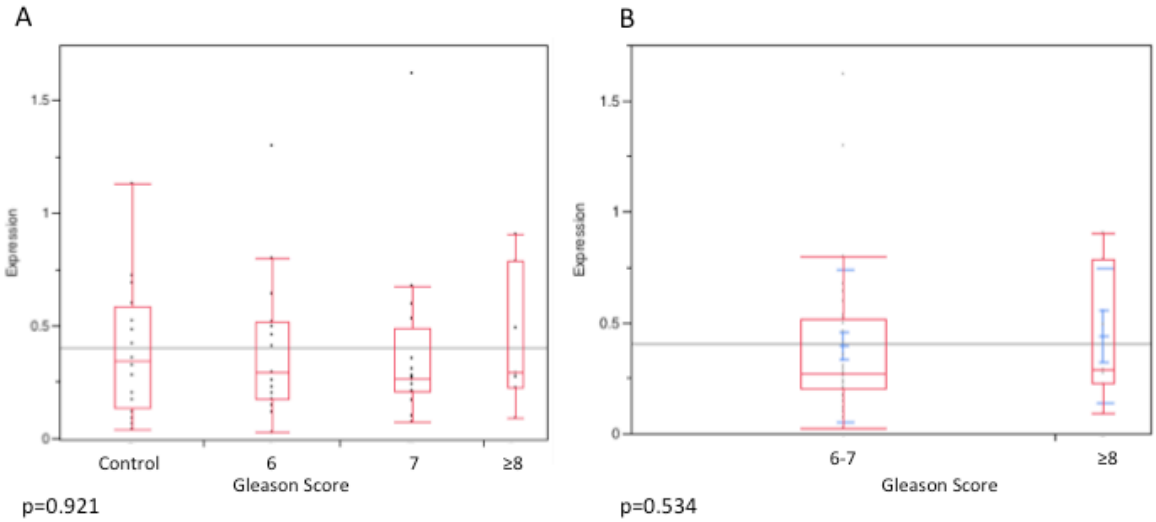
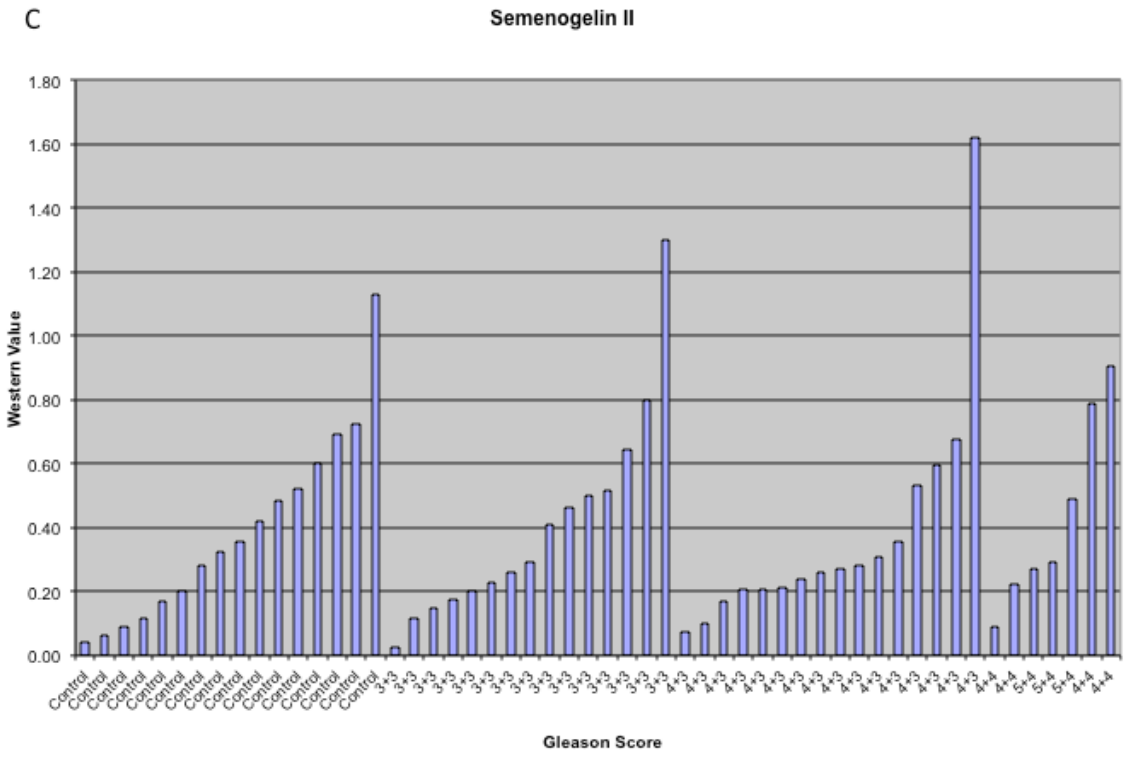


Figure 2: Scatter plot (A) and individual patient column chart (B) illustrating semi-quantitative Western blot analysis of urinary expression of Semenogelin II (65kd) in 54 patients: 16 controls, 15 Gleason 3+3, 16 Gleason 4+3, 7 Gleason 8-9.



cohort included 16 biopsy negative controls, 15 men with Gleason 3+3, 16 men with Gleason 4+3, and 7 men with Gleason 8-9. The median expression values for Gleason 6/7 and Gleason ≥8 disease were 0.27 (IQR 0.20-0.52) and 0.29 (IQR 0.22-0.979), respectively.

To further investigate the expression of Semenogelin II in urine, we performed ELISA

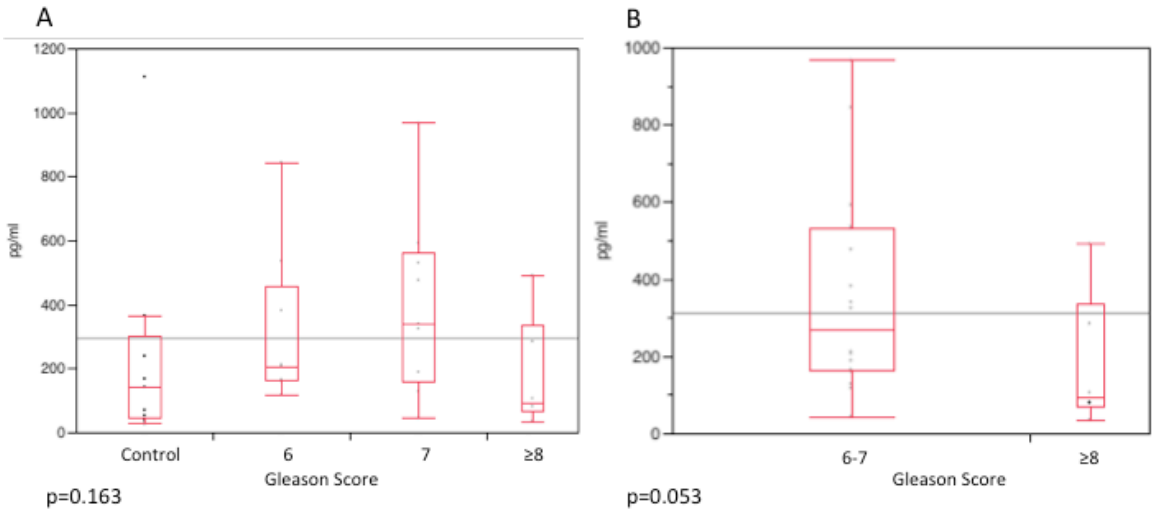
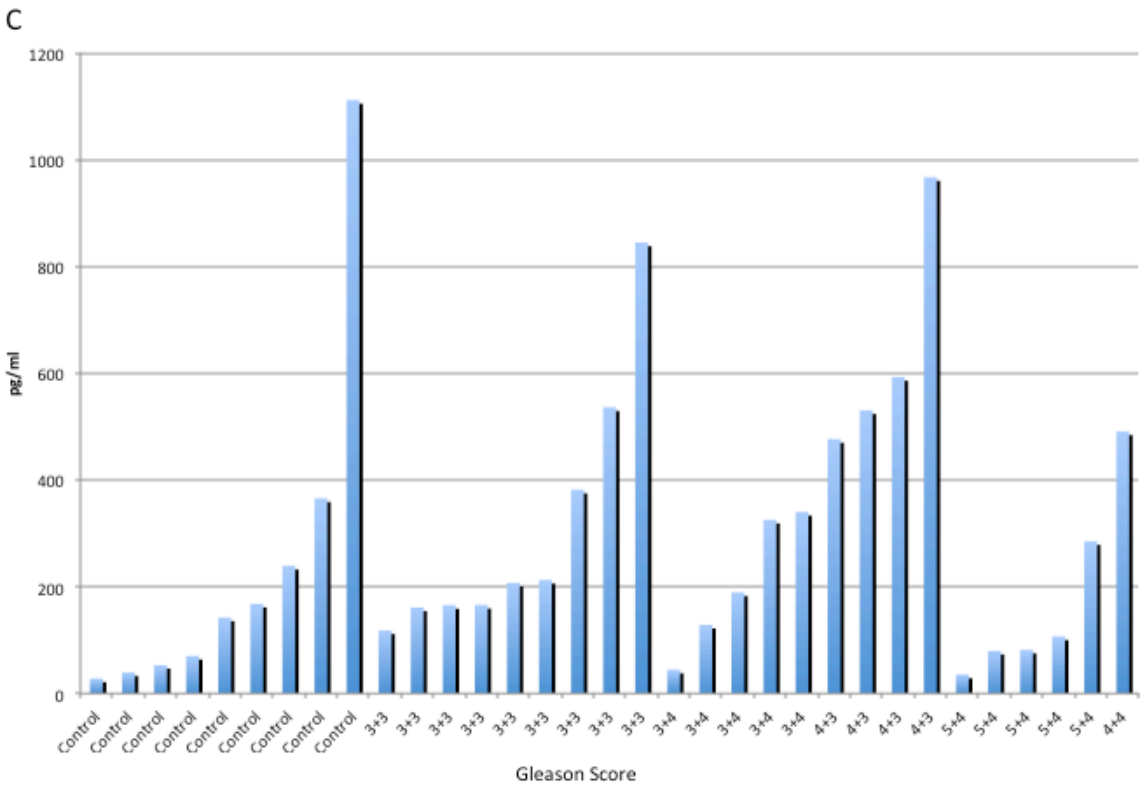


Figure 3: Scatter plot (A) and individual patient column chart (B) illustrating quantitative ELISA of urinary expression of Semenogelin II in 33 patients: 9 controls, 9 Gleason 6, 9 Gleason 7, 6 Gleason 8-9.



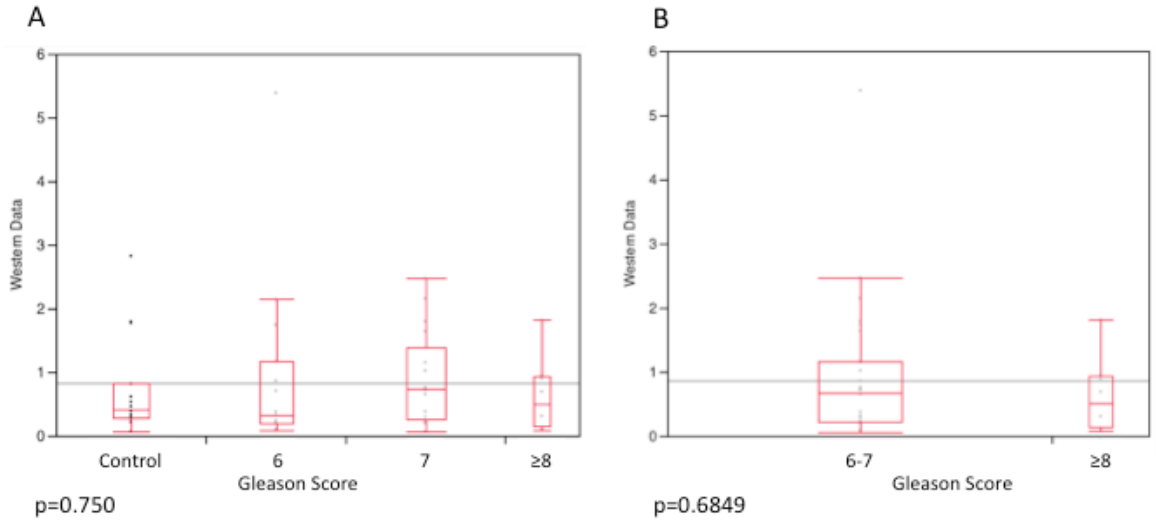
(Wuhan USCN Business Co., Ltd.) on the urinary protein isolate. Interestingly, we saw more of a trend in expression, with lower expression in high grade cancers (Gleason 8-9) as compared to Gleason 6 and 7 prostate cancer specimens (Figure 3). Although this relationship bordered on statistical significance with a p value of 0.053, it is likely underpowered to demonstrate this relationship. Interestingly, this observed trend of reduced expression in higher risk disease may be supported in the published literature on Semenogelin in prostate cancer. Izumi, et al.[1] investigated the expression of Semenogelin I and II in prostate cancer tissues and identified that although there was an increased intranuclear expression of these proteins in prostate cancer, there was also a decreased secretion of these proteins in prostate cancer. Canacci, et al.[2] demonstrated a reduction in Semenogelin II expression in Gleason 8 and higher tumors compared with lower grades, and also found that Semenogelin II-negative tumors had a greater risk of biochemical recurrence after radical prostatectomy. We are currently expanding our own investigation of this relationship and are comparing these expression profiles with the clinical outcomes of these patients over time.

In addition to our work with Semenogelin II, given our prior Western blot results and biological plausibility of Serpin B1 (Leukocyte Elastase Inhibitor), we pursued further investigation of this potential marker. Serpin B1 is a serine protease inhibitor in the

[1] Izumi K, Li Y, Zheng Y, et al. Seminal plasma proteins in prostatic carcinoma: increased nuclear semenogelin I expression is a predictor of biochemical recurrence after radical prostatectomy. Human Pathology (2012). 43:1991-2000.
[2] Canacci AM, Izumi K, Zheng Y, et al. Expression of semenogelins I and II and its prognostic significance in human prostate cancer. The Prostate (2011). 71:1108-1114.

cytoplasm of polymorphonuclear neutrophils, acting on cathepsin G and proteinase-3, helping to protect the cell from damage at tissue inflammatory sites.

Similar to our evaluation of Semenogelin II described above, we investigated the urinary expression of Serpin B1 using Western blot analysis in 54 patients, including 16 biopsy negative controls, 15 men with Gleason 3+3, 16 men with Gleason 4+3, and 7 men with Gleason 8-9. Across all groups, we saw no clear trend in expression, as demonstrated in Figure 4A. The median expression values for Gleason 6/7 and Gleason ≥8 disease were 0.68 (IQR 0.22-1.16) and 0.50 (IQR 0.14-0.94), respectively. This difference, however, was not statistically significant as seen in Figure 4B. Figure 4C demonstrates individual patient expression levels of Serpin B1. Ashida, et al.[3] have suggested that Serpin B1 expression may be reduced in prostate cancer compared with benign prostate tissue. We are continuing to investigate our cohort of men for expression of Serpin B1 in urine via ELISA.



[3] Ahida S, Nakagawa H, Katagiri T, et al. Molecular features of the transition from prostatic intraepithelial neoplasia (PIN) to prostate cancer: genome-wide expression profiles of prostate cancers and PINs. Cancer Research (2004). 64:5963-5972.

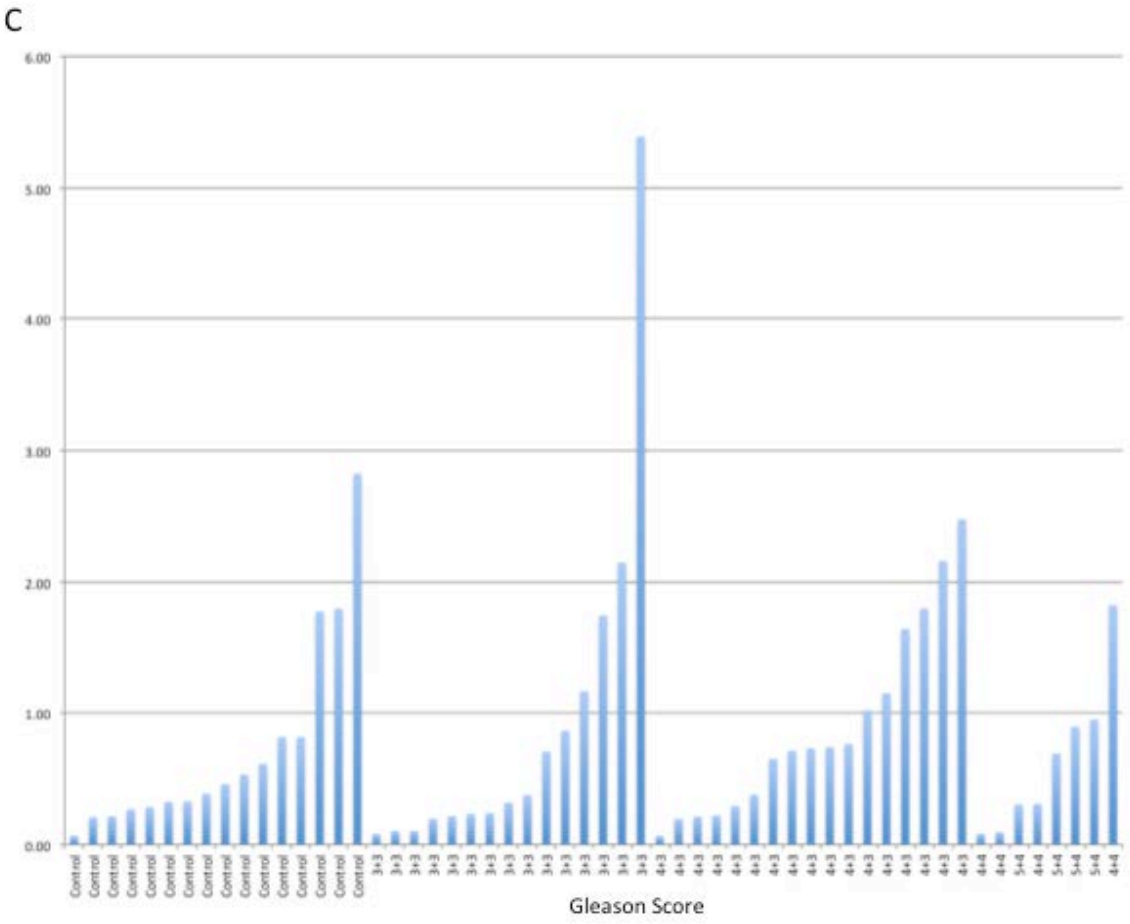


Figure 4: Scatter plot (A) and individual patient column chart (B) illustrating semi-quantitative Western blot of urinary expression of Serpin B1 (65kd) in 54 patients: 16 controls, 15 Gleason 3+3, 16 Gleason 4+3, 7 Gleason 8-9.

In addition to a proteomic investigation for novel biomarkers in prostate cancer, we have also begun to use metabolomics for urinary biomarker discovery. We build upon our experience in investigating metabolomic changes in prostate cancer and normal tissues in collaboration with Leo L. Chang, Ph.D., here at Massachusetts General Hospital. This is an NIH funded project in which we investigate the metabolomics profiles of prostate cancer tissue. Through this study we have investigated metabolomic signatures in prostatectomy specimens and prostate biopsies using *ex vivo* MR spectroscopy. We have begun to utilize multiparametric prostate MRI and MRI-Ultrasound fusion biopsy of the prostate to investigate biopsy cores taken from MRI targetable lesions and uninvolved prostate regions that appear normal by imaging criteria. Figure 5 demonstrates metbolomic spectra of prostate cancer regions compared with non-malignant prostate tissue.

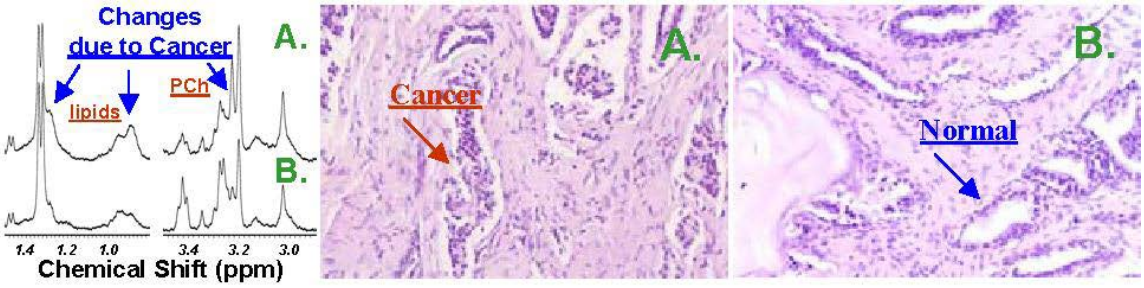


Figure 5: Metabolomic spectra can be seen in the left panel from prostate cancer tissue (A) and non-malignant prostate tissue (B), obtained from the same patient.

We have now begun collecting voided urine specimens for metabolomic profiling in men undergoing prostate biopsy who enroll in our prostate cancer metabolomics study. In addition to assessing their biopsy cores in the described *ex vivo* manner using MR spectroscopy, we also assess the paired urine specimens using nuclear magnetic resonance (NMR). Thus far we have collected such matched specimens from eight patients at the time of MRI-Ultrasound fusion biopsy of the prostate. Examples of spectra obtained from urine and matched biopsy core samples from a patient with prostate cancer are presented in Figure 6A, while its urine spectrum was compared with that of patient

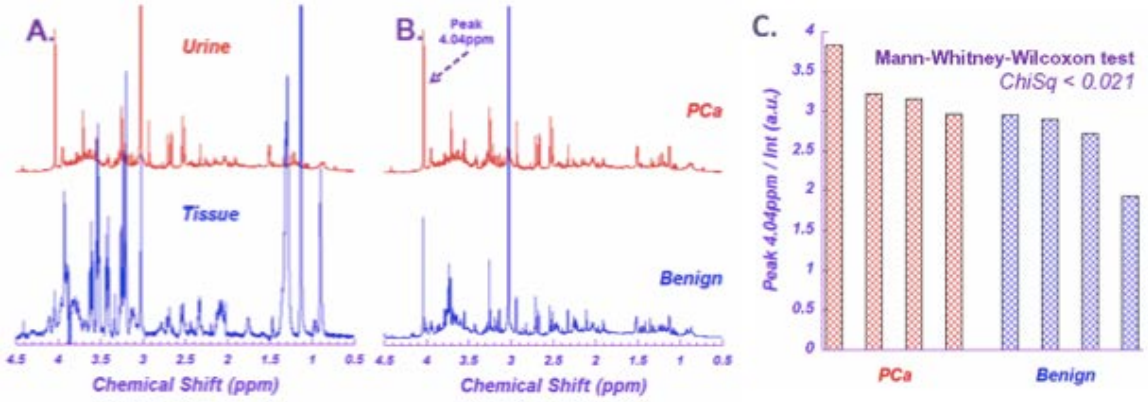


Figure 6: (A) Metabolomic spectra of urine and prostate cancer tissue from a patient found to have prostate cancer on biopsy. (B) Metabolomic spectra of urine from patients with and without prostate cancer. (C) Comparisons of urine spectral intensity at 4.04ppm from patients with and without prostate cancer.

with a benign fusion biopsy result (Figure 6B). Comparisons of urine spectra from patients with prostate cancer and benign biopsies revealed a significant difference in the spectral intensity for the resonance at 4.04ppm, according to the Mann-Whitney-Wilcoxon (t-test for non-normal distributed samples) Test (Figure 6C). Identification of the resonance and verification with additional patients are underway with this ongoing project.

In addition to our laboratory work, we continued to build on our previous work in further developing our clinical database and evaluating our cohort of men on active surveillance (AS) for low risk prostate cancer. Our database now consists of 992 men on active surveillance for low risk prostate cancer identified through billing and pathology records. We are continuing to update this database and investigate clinical outcomes in this cohort.

Although AS had been practiced throughout this entire period, in 2008 our group agreed upon formal guidelines for AS at our institution. Inclusion guidelines included Gleason ≤ 6, Gleason 7 in select patients with low volume, no more than 3/12 cores positive with ≤20% in each core, and PSA <10. Our AS follow-up protocol involves PSA testing and a digital rectal examination every four months for one year, followed by every six months for two years, and then annually. Those on AS also have a mandatory repeat 12-core biopsy 6-12 months after initial diagnosis, although we have recently been increasing the utilization of multiparametric prostate MRI and MR-ultrasound Fusion prostate biopsy when a targetable lesion is found. Additional biopsies after the first confirmatory biopsy are at the discretion of the treating physician.

In this past year we have published our manuscript on 469 men within our AS cohort in the journal, Urologic Oncology. The results of this work were included in my previous annual report last year. We have continued to investigate this growing cohort and more recently have investigated the outcomes of younger men who initiate active surveillance for low risk prostate cancer at the age of 60 years or less. This is a group of men on which there is a paucity of literature.

Our group of men who started active surveillance at 60 years or younger consists of 177 men, all of whom had Gleason 6 disease on their intial diagnostic biopsy. Median age was 55 years and 92.7% were clincial stage T1c. Baseline characteristics of the cohort are seen in Figure 7A and pathology on repeat biopsy is listed in Figure 7B. 28.8% progressed to treatment for the indications listed in Figure 7C. Interestingly, of those who went on to have surgery, 16.2% were found to have pT3 disease. Over a median follow up of 4.4 years, 20.6% (32/155) of men were ultimately upgraded on any subsequent biopsy or at the time of radical prostatectomy (RP), and 32.4 % (12/37) of men upgraded at time of RP compared to last pre-RP biopsy. This cohort demonstrates that AS is a reasonable option for carefully selected men under 60 with very low risk prostate cancer, however, patients must be surveyed closely and understand the risk of ultimately needing treatment.

A

At Diagnosis:	
Median Age	55 (IQR 54.1 – 57.7)
Median PSA	4.7ng/mL (IQR 3-5.6)
Gleason ≤ 6	177/177
Stage T1a	1/177 (0.6%)
Stage T1c	164/177 (92.7%)
Stage T2a	12/177 (6.7%)

B

Pathology on repeat biopsy	
Repeat biopsy	152/177 (85.9%)
• Prostate CA	94/152 (61.8%)
• Benign	39/152 (25.7%)
• PIN	11/152 (7.2%)
• Atypia	8/152 (5.3%)

C

Reasons for progression to treatment in 51/177 (28.8%)	
Pathologic Progression	35/51 (68.6%)
PSA progression	9/51 (17.6%)
Patient Preference	6/51 (11.8%)
Other	1/51 (2.0%)

D

Treatment modalities in young men previously on AS	
Surgery	37/51 (72.5%)
pT2	31/37 (83.8%)
pT3	6/37 (16.2%)
Ext Beam Radiation	10/51 (19.6%)
Brachytherapy	4/51 (7.8%)

Figure 7: Baseline data and outcomes of men on active surveillance for low-risk prostate cancer, who started on active surveillance at the age of 60 or younger.

In addition to significant research accomplishments, I continue to meet my goals within the training program of this grant. I meet regularly with my two mentors, Drs. Matthew Smith and Bruce Zetter. In our regular meetings, we not only discuss research progress, but also focus on career planning and guidance. I attend regular urologic oncology clinical and research conferences at our institution and both attend and present at regional and national scientific meetings. I attend regular laboratory research meetings both for our own research progress, as well as reviewing other associated research in the current literature. I also have participated multiple times as an invited reviewer of research grant applications for the Prostate Cancer Foundation Young Investigator Awards and Challenge Awards.

Key Research Accomplishments:

- Further analysis of potential proteomic urine based prostate cancer biomarkers, including Semenogelin II and Serpin B1.
- Initiation of investigation into urine based metabolomic signatures of prostate cancer detection and disease grade, as compared with the metabolomics profiles of patient matched prostate cancer tissue specimens.
- Continued development analysis of our large database of our cohort of men with low risk prostate cancer on active surveillance, including the publication of a manuscript and investigation of younger men on active surveillance.

Reportable Outcomes:

- *Preston MA, ***Feldman AS**, Coen JJ, McDougal WS, Smith MR, Paly JJ, Carrasquillo R, Wu CL, Dahl DM, Barrisford GW, Blute MB, Zietman AI. Active surveillance for prostate cancer: need for intervention and survival at 10 years. Urol Oncol. 2015 Sep;33(9):383.e9-16.
  *Co-first Authorship
- Ringer L, Sirajuddin P, Tricoli L, Waye S, Choudhry MU, Parasido E, Sivakumar A, Heckler M, Naeem A, Abdelgawad I, Liu X, **Feldman AS**, Lee RJ, Wu CL, Yenugonda V, Kallakury B, Dritschilo A, Lynch J, Schlegel R, Rodriguez O, Pestell RG, Avantaggiati ML, Albanese C. The induction of the p53 tumor suppressor protein bridges the apoptotic and autophagic signaling pathways to regulate cell death in prostate cancer cells. Oncotarget. 2014 Nov 15;5(21):10678-91.
- Kuppermann D, Preston MA, Paly JJ, Dahl DM, Efstathiou JE, Blute MB, Zietman AI. **Feldman AS.** Active surveillance for low risk localized prostate cancer in men under 60 years of age. *Presented at the AUA: Combined NE-MA sectional meeting, 2015.*

Conclusion:

In summary, these past four years of my DOD PCRP PRTA have been very productive. We thoroughly investigated our list of biologically relevant candidate prostate cancer biomarkers and have demonstrated promising results with TIMP-1, Semenogelin II and Serpin B1. We are continuing to investigate these markers in localized and metastatic disease are moving forward toward the development of a manuscript discussing the discovery and analysis of these markers.

Our new approach to include metabolomics profiling is also very exciting as a method for biomarker identification which takes a novel approach and integrates findings in tissue, in addition to urine.

In addition to success in our laboratory work, we have also made significant accomplishments in continued analysis of our large cohort of men on active surveillance for prostate cancer and continue to build this database and further assess multiple important clinical questions.

This described work is very relevant to current clinical practice in prostate cancer and meets any potential "so what" criteria. New diagnostic and predictive biomarkers with improved performance characteristics than prostate specific antigen (PSA) are sorely needed. The work funded by this grant directly addresses that challenge and we are already beginning to produce results toward that goal. In addition, it is clear that we have historically over-treated low risk prostate cancer. Active surveillance is a management strategy for low risk disease which will help ameliorate the problem of overtreatment. Our large database of men on active surveillance will help us to understand the safety, efficacy and outcomes of this strategy and will help us better select men for AS in the future. Biomarker analysis within this cohort will also help us better understand who truly has very low risk disease and can safely avoid radical treatment.

Appendices:
Curriculum Vitae for Dr. Adam S. Feldman is included in this annual reporting.

Curriculum Vitae

Date Prepared: June 18, 2015

Name: Adam S. Feldman, M.D., M.P.H.

Office Address:

Department of Urology
Massachusetts General Hospital
55 Fruit Street, GRB 1102
Boston, MA 02114 United States

Education

1994	B.A. - Biological Basis of Behavior	University of Pennsylvania
1996	M.A. (Alpha Epsilon Lambda) - Medical Sciences	Boston University School of Medicine
2000	M.D. (Alpha Omega Alpha)	University of Massachusetts Medical School
2009	M.P.H. – Clinical Effectiveness	Harvard School of Public Health

Postdoctoral Training

07/00-06/01 Intern in Surgery, Massachusetts General Hospital
07/01-06/02 Resident in Surgery, Massachusetts General Hospital
07/02-06/05 Resident in Urology, Massachusetts General Hospital
07/05-06/06 Chief Resident in Urology, Massachusetts General Hospital
07/06-06/08 Fellow in Urologic Oncology, Massachusetts General Hospital

Faculty Academic Appointments

2000-2006 Clinical Fellow in Surgery, Harvard Medical School, Boston, MA
2006-2010 Instructor in Surgery, Harvard Medical School, Boston, MA
2010-present Assistant Professor of Surgery, Harvard Medical School, Boston, MA

Appointments at Hospitals/Affiliated Institutions

2006-present Assistant in Urology, Massachusetts General Hospital, Boston, MA

Major Administrative Leadership Positions

2011 Scientific Program Chair, American Urological Association, New England and Mid-Atlantic Sections, Annual Meeting

Other Professional Positions

2012 American Urological Association Representative, Lower Anogenital Squamous Terminology Standardization (LAST) Consensus Conference, 2012
2012 Member: Scientific Program Committee, American Urological Association, New England Section Annual Meeting
2012-present Board Member: Sean Kimerling Testicular Cancer Foundation
2013-present Co-Leader of the Career Development Program: DFCI/HCC Prostate Cancer SPORE

Committee Service - Local

2012-present Member: Surgical Coordination Committee, Department of Urology, MGH
2013-present Member: MGH eCare Big Data and Data Repository Workgroup
2013-present Urology Representative: Clinical Research Workgroup of the Continuous of the Continuous Research Operations Improvement (CROI) Task Force

Committee Service - Regional

2012-present Member: Massachusetts Medical Society Committee on Men's Health

Committee Service - National

2013-present Member: Eastern Cooperative Oncology Group (ECOG) Genitourinary Committee

Professional Societies

1998-present Massachusetts Medical Society, Member
2002-present American Urological Association, Member
2004-present American Association of Clinical Urologists, Member

Grant Review Activities

2012-13 Prostate Cancer Foundation Young Investigator Awards Review Committee
2013-15 Bladder Cancer Advocacy Network Young Investigator Awards Review Committee
2013-14 Prostate Cancer Foundation Challenge Awards Review Committee
2013 Prostate Cancer Foundation Young Investigator Awards Review Committee

Editorial Activities

2006 Ad-Hoc Reviewer, International Braz J Urol
2007-present Ad-Hoc Reviewer, Journal of Urology
2010-present Ad-Hoc Reviewer, Urology
2010-present Ad-Hoc Reviewer, Prostate Cancer and Prostatic Diseases
2010-present Ad-Hoc Reviewer, Urologic Oncology
2011-present Ad-Hoc Reviewer, BJU International
2012-present Ad-Hoc Reviewer, Molecular Cancer Research
2013-present Ad-Hoc Reviewer, European Urology

Editorial Board

2015-present Editorial Board Member, BMC Urology

Honors and Prizes

1996 Alpha Epsilon Lambda - Graduate Honors Society, Boston U. School Of Medicine
2000 Senior Scholar - Department of Surgery, U. Of Massachusetts Medical School
2000 Alpha Omega Alpha Honor Medical Society, U. Of Massachusetts Medical School
2003 Resident Abstract Travel Award, American Urological Association - New England Section

2005	Merit Award for Outstanding Abstract, The ASCO Foundation Grants Program – Multidisciplinary Prostate Cancer Symposium
2006	Gerald P. Murphy Scholar, American Urological Association
2008	Merit Award for Outstanding Abstract, The ASCO Foundation Grants Program – Multidisciplinary Genitourinary Cancers Symposium
2009	AUA Foundation Research Forum – AUA New England Section Nominee
2008	Prostate Cancer Foundation Young Investigator Award
2011	CINE Golden Eagle Award – CBS Public Service Announcement on Prostate Cancer
2011	Best Poster - Annual Meeting of the American Urological Association, Washington, D.C.
2012	AUA Foundation Research Forum – AUA New England Section Nominee

Report of Funded and Unfunded Projects

Funding Information
Past:

1997	Student	Institutional Grant, Joseph P. Healy Grant, Pre-clinical Intercultural Program, University of Massachusetts Medical School • Summer intercultural immersion program in clinical medicine in Latino community in Miami, FL
1997-1998	Project Director	Institutional Grant, Community Service Grant funding Creating Our Future Program, University of Massachusetts Medical School • Program in which medical students tutored and mentored children of homeless families in Worcester, MA
2007-2008	P.I.	Claire and John Bertucci Prostate Cancer Research Fund, A Proteomic Approach to Prostate Cancer Biomarker Discovery • Use proteomic techniques for urine biomarker discovery in men with prostate cancer
2007-2009	P.I.	Company – Predictive Biosciences; Evaluation of Urine Based Protein Biomarkers in Bladder Cancer • Analyze urinary proteins as novel diagnostic and surveillance markers in bladder cancer • Sponsored Research Agreement
2009-2010	P.I.	Claire and John Bertucci Prostate Cancer Research Fund - Active Surveillance for Prostate Cancer: Management Patterns, Outcomes, and Quality of Life • Funding supports research personnel for data mining and management
2008-2012	P.I.	Prostate Cancer Foundation – Young Investigator Award; Proteomic Discovery and Analysis of Novel Biomarkers in Prostate Cancer

- Use proteomic mass spectrometry techniques for identification of novel prostate cancer biomarkers in urine and serum

2009-present Investigator Harvard Catalyst Pilot Grant Program
NIH UL1 RR 025758-02 Clinical and Translational Science Center Grant
Sonoelastography for Tumor-Targeted Prostate Biopsy

- This study is a pilot study of the utility of sonoelastography for targeting biopsy to foci of cancer in the prostate.

Current:

2009-present Investigator RTOG 0712: A Phase II Randomized Study for Patients With Muscle-Invasive Bladder Cancer Evaluating Transurethral Surgery and Concomitant Chemoradiation by Either BID Irradiation Plus 5-Fluorouracil and Cisplatin or QD Irradiation Plus Gemcitabine Followed by Selective Bladder Preservation and Gemcitabine/Cisplatin Adjuvant Chemotherapy

2011-present P.I. Department of Defense Prostate Cancer Research Program - Physician Research Training Award; Analysis of Novel Prostate Cancer Biomarkers and Their Utility in an Active Surveillance Protocol

- The research project will investigate novel biomarkers in prostate cancer detection and prediction of disease outcome.

$130,000 per year for 5 years

2013-present P.I. Project Title: Validating Conditionally Reprogrammed Cells to Advance Personalized Medicine for Prostate Cancer
Role on the Project: Site PI
Supporting Agency: Georgetown University/DoD (W81XWH-12-PCRP)

2013-present P.I. Project Title: A Collaborative Study Using Primary Prostate Cells and their Reprogramming for the Study of Progression to Castrate Resistant Prostate Cancer
Role on the Project: Site PI
Supporting Agency: Georgetown University/GHUCCTS/Clinical and Translational Science Awards

2013-present Investigator RTOG0938: A Randomized Phase II Trial of Hypofractionated Radiotherapy for Favorable Risk Prostate Cancer

2013-present Investigator Phase III randomized clinical trial of proton therapy vs IMRT for low or low-intermediate risk prostate cancer

2013-present Investigator Characterizing Prostate Cancer by ex vivo MRS Signature (Cheng)
NIH/NCI, R01CA115746
The proposed project is aimed at permitting translation of our pre-clinical human study results into new diagnostic and evaluation paradigms for the PCa clinic.

Unfunded Projects

Past:

1991	Research Assistant	Isolation and sequencing of a conserved domain of the DnaJ family of chaperonins. Department of Surgical Research, Children's Hospital, Boston, MA.
1994-1995	Research Assistant	Evaluation of Critical Pathways for CHF, DVT, and Normal Vaginal Delivery with 24 hour LOS. Brigham and Women's Hospital, Boston, MA.
1994-1995	Research Assistant	Adverse Drug Events Prevention Study Group. Brigham and Women's Hospital, Harvard School of Public Health.
1999-2000	Research Fellow	Characterization of Angiogenic Markers in the Rat Genitourinary System. Laboratory for Cellular Therapeutics and Tissue Engineering, Department of Urology, Children's Hospital, Boston, MA.
2002-2004	Investigator	Development of bladder cancer in a murine model for Cables knock-out mice exposed to N-butyl-N-(4-hydroxybutyl)nitrosamine (BBN). Laboratory of Urology/Pathology, Massachusetts General Hospital, Boston, MA.
2002-2004	Investigator	The Role of Cables, a novel cell-cycle regulatory protein in human transitional cell carcinoma and prostate cancer. Laboratory of Urology/Pathology, Massachusetts General Hospital, Boston, MA.
2004-2005	Investigator	Proteomic analysis of voided urine specimens for biomarker discovery and validation in prostate and bladder cancer. Laboratory of Urology/Pathology, Massachusetts General Hospital. Department of Vascular Biology, Children's Hospital, Boston, MA.
2007-2008	Investigator	Laparoscopic and Open Radical prostatectomy after laparoscopic inguinal hernia repair. Massachusetts General Hospital, Boston, MA.
2010	Investigator	Outcomes of Organ Sparing Surgery in Penile Cancer. Massachusetts General Hospital, Boston, MA.
2010- 2012	Investigator	Multi-Institutional Bladder Cancer Quality Care Initiative for non-metastatic muscle invasive transitional cell carcinoma of the bladder.

Current:

2006-present	P.I.	A comparison of nephron sparing techniques: percutaneous radiofrequency ablation (RFA) vs. open and laparoscopic partial nephrectomy. Massachusetts General Hospital, Boston, MA.
2009-present	P.I.	Active Surveillance in Prostate Cancer: Retrospective analysis of quality of life and outcomes and development of a prospective cohort. Massachusetts General Hospital, Boston, MA.
2010-present	P.I.	Renal Biopsy for Small Renal Masses. Massachusetts General Hospital, Boston, MA.
2013-present	Investigator	PARTIQoL (Prostate Advanced Radiation Technologies Investigating Quality of Life) Registry

Report of Local Teaching and Training

Teaching of Students in Courses

2006-present Urologic Surgery

		contact time	*prep time*
Attending	30 Medical Students 8 Residents	10 hours/week for 50 week(s)	none reported

2008-2010 Patient Doctor II

		contact time	*prep time*

	Attending	5 Medical Students	8 hours/year for 1 year(s)	none reported
2010	HMS2 Pathophysiology			
			contact time	*prep time*
	Attending	25 Medical Students	3 hours/year for 1 year(s)	3 hours

Formal Teaching of Residents, Clinical Fellows and Research Fellows (post-docs)

2007	Surgical Chief's Rounds - Department of Surgery - Injuries to the Urogenital Tract			
			contact time	*prep time*
	Lecturer	25 Residents	1 hour	5 hours
2008-present	Ambulatory Teaching Rounds - Department of Medicine – Uro-oncology for the primary care physician; Management of Small Renal Masses			
			contact time	*prep time*
	Lecturer	30 Residents	4 hours/year	10 hours/year
2010	General Surgery Teaching Rounds – Department of Surgery – Bladder Cancer Review			
			contact time	*prep time*
	Lecturer	25 Residents	0.5 hour	3 hours

Clinical Supervisory and Training Responsibilities

2006-present	Urological Surgery – Training of Residents/Fellows	15 hours/week
2008-present	Sub-specialty Faculty Advisor for the Acute Care Surgery fellow	10 hours/year

Laboratory and Other Research Supervisory and Training Responsibilities

2007-present	Supervision and mentoring of Research Fellow	5 hours/week

Formal Teaching of Peers (e.g., CME and other continuing education courses)

1996-1997	Worcester, MA	Teaching Assistant/Tutor in Biochemistry, University of Massachusetts Medical School Responsibility: Tutor fellow medical students in Biochemistry.
2009	Las Vegas, NV	Faculty (CME Course): Maximizing Bone Health for Patients With Prostate Cancer: Establishing the "Who, What, Why & How?"
2009	Scottsdale, AZ	Faculty (CME Course): Maximizing Bone Health for Patients With Prostate Cancer: Establishing the "Who, What, Why & How?"
2010	San Francisco, CA	Faculty (CME Course): Master Class on Integrating Novel Antiresorptive Agents into the treatment of Prostate Cancer
2010	Boston, MA	Faculty (CME Course): Trauma and Critical Care Symposium – Penile and Genitalia Trauma
2011	Boston, MA	Faculty (CME Course): Society of Translational Oncology Prostate Cancer Symposium – Prostate Cancer: Progress and Promise
2011	Cambridge, MA	Faculty (CME Course): Primary Care Internal Medicine: Principles & Practice – Case Studies in Urology *[Invited Lecture]*
2013	Ft. Lauderdale, FL	Faculty (CME Course): Winter Ongology Symposium – Holy Cross Hospital

2013	Waltham, MA	Faculty (CME Course): Men's Health Symposium – Prostate Cancer: Screening, Management and Controversy
2013	Chicago, IL	Faculty (CME Course): Radiologic Society of North America – Refresher course: Small renal mass (T1a) – the case for resection
2014	Cambridge, MA	Faculty (CME Course): Primary Care Internal Medicine: Principles & Practice – Male Urology [Invited Lecture]
2014	Boston, MA	Faculty (CME Course): 17th Biennial Urologic Cancer Course – Bladder Cancer Biomarkers
2014	Chicago, IL	Faculty (CME Course): Radiologic Society of North America – Refresher course: Small renal mass (T1a) – the case for resection
2015	Video Series	Faculty (CME Course): Comprehensive Review of Urology – Penile and Urethral Cancer

Report of Regional, National and International Invited Teaching and Presentations

Local Invited Presentations and Courses

2008	Boston, MA	Comparative Analysis of Nephron Sparing Techniques. Update on Urologic Oncology – Massachusetts General Hospital, Harvard Medical School *[Invited Lecture]*
2008	Boston, MA	Prostate Cancer: Diagnosis and Management. Prostate Cancer Support Group, Massachusetts General Hospital *[Invited Lecture]*
2011	Boston, MA	Controversies Around the Management of Small Renal Masses – DF/HCC Kidney Cancer Program *[Invited Lecture]*
2011	Boston, MA	Proteomic Discovery of Novel Biomarkers in Prostate Cancer – Massachusetts General Hospital Department of Urology Centennial Academic Program *[Invited Lecture]*
2011	Cambridge, MA	Management of Small Renal Masses – Harvard University Health Services Grand Rounds *[Invited Lecture]*
2011	Boston, MA	Incidental Radiologic Findings: "Incidental Renal Masses" – Massachusetts General Hospital Medical Grand Rounds *[Invited Lecture]*
2012	Concord, MA	Controversies in the Management of the Small Renal Mass – Emerson Hospital Medical Grand Rounds *[Invited Lecture]*
2014	Boston, MA	Mangement of Renal Lesions in Tuberous Sclerosis Complex – Massachusetts General Hospital Department of Pathology Grand Rounds [Invited Lecture]

Regional Invited Presentations and Courses

2009	Dedham, MA	Urologic Oncology: An Overview. Massachusetts Health Information Management Association *[Invited Lecture]*
2010	Mt. Kisco, NY	Controversies in the Management of Small Renal Masses *[Invited Lecture]*
2011	Dedham, MA	Penile Cancer. Urology Nursing Society *[Invited Lecture]*
2012	Boston, MA	AUA Update in Bladder and Prostate Cancer. AUA New England Section, Annual Meeting

2013	Ft. Lauderdale, FL	Faculty (CME Course): Winter Ongology Symposium – Holy Cross Hospital
2013	Waltham, MA	Faculty (CME Course): Men's Health Symposium – Prostate Cancer: Screening, Management and Controversy

National Invited Presentations and Courses

2007	Hollywood, FL	Radical prostatectomy after inguinal hernia repair. The American Hernia Society *[Invited Lecture]*
2009	Boston, MA	Renal Cell Carcinoma: Surgical Management at Massachusetts General Hospital. Exchange Experience Program on Renal Cancer *[Invited Lecture]*
2009	Las Vegas, NV	Faculty (CME Course): Maximizing Bone Health for Patients With Prostate Cancer: Establishing the "Who, What, Why & How?" *[Invited Lecture]*
2009	Scottsdale, AZ	Faculty (CME Course): Maximizing Bone Health for Patients With Prostate Cancer: Establishing the "Who, What, Why & How?" *[Invited Lecture]*
2010	San Francisco, CA	Faculty (CME Course): Master Class on Integrating Novel Antiresorptive Agents into the treatment of Prostate Cancer. *[Invited Lecture]*
2010	Boston, MA	Faculty (CME Course): Trauma and Critical Care Symposium – Penile and Genitalia Trauma. *[Invited Lecture]*
2011	Boston, MA	Faculty (CME Course): Society of Translational Oncology Prostate Cancer Symposium – Prostate Cancer: Progress and Promise
2011	Cambridge, MA	Faculty (CME Course): Primary Care Internal Medicine: Principles & Practice – Case Studies in Urology *[Invited Lecture]*
2013	New Orleans, LA	Faculty – 3D Laparoscopic Urology: Surgical Techniques and Hands-On
2013	Chicago, IL	Faculty (CME Course): Radiologic Society of North America – Refresher course: Small renal mass (T1a) – the case for resection
2014	Cambridge, MA	Faculty (CME Course): Primary Care Internal Medicine: Principles & Practice – Male Urology *[Invited Lecture]*
2014	Boston, MA	Faculty (CME Course): 17th Biennial Urologic Cancer Course – Bladder Cancer Biomarkers
2014	Chicago, IL	Faculty (CME Course): Radiologic Society of North America – Refresher course: Small renal mass (T1a) – the case for resection
2015	New Orleans, LA	Society of Urologic Oncology, May 2015 – Primary Penile Sparing: Treatment Approaches

International Invited Presentations and Courses

2011	Mallorca, Spain	5th International Urology Forum – The Potential of Nanoparticle Enhanced Imaging in the Accurate Detection of Lymph Node Metastases *[Invited Lecture]*
2012	Mallorca, Spain	6th International Urology Forum – Renal Mass Biopsy *[Invited Lecture]*

Report of Clinical Activities and Innovations

Current Licensure and Certification

2002	Diplomate, National Board of Medical Examiners
2004	Massachusetts Registered Physician

Practice Activities

Urology/Urologic Oncology, Laparoscopy and Endourology	Massachusetts General Hospital
Attending Urologic Surgeon, Polycystic Kidney Disease Clinic	Massachusetts General Hospital

Report of Technological and Other Scientific Innovations

Patents

1. Zetter BR, Feldman AS, McDougal WS. Methods for diagnosis and prognosis of epithelial cancers. U.S. provisional Patent Application. 2006 Mar 8.

    - Potential use of biomarkers as diagnostic or prognostic markers in bladder cancer. These are currently under ingestigation and are not yet being used in clinical care
    - My contribution was and is the discovery and analysis of the patented biomarkers

Report of Education of Patients and Service to the Community

Activities

1996-1998 Director (1997-1998) Volunteer (1996-1997), Creating Our Future Program - Worcester Family Health and Social Services Center

Educational Material for Patients and the Lay Community:

2010 **Feldman AS.** Essay on Prostate Cancer. CBS Cares: Prostate Cancer Campaign. cbscares.com.

2011 **Feldman AS.** Essay on Testicular Cancer. CBS Cares Valentine's Day Campaign on Testicular Cancer. cbscares.com.

2011 **Feldman AS.** Patient information: Blood in the urine (hematuria) in adults. UpToDate 19.3. October 14, 2011.

Report of Scholarship

Peer Reviewed Publications in print or other media:

Research Investigations:

1. Eisner BH, **Feldman AS**, Chapin BF, Dretler SP. "Blind coning"--using the Stone Cone for removal of intramural ureteral calculi. Urology. 2007;69(4):773-5.
2. Banyard J, Bao L, Hofer MD, Zurakowski D, Spivey KA, **Feldman AS,** Hutchinson LM, Kuefer R, Rubin MA, Zetter BR. Collagen XXIII expression is associated with prostate cancer recurrence and distant metastases. Clin Cancer Res. 2007;13(9):2634-42.
3. **Feldman AS**, Banyard J, Wu C-L, McDougal WS, Zetter BR . Cystatin B as a tissue and urinary biomarker of bladder cancer recurrence and disease progression. Clin Cancer Res. 2009;15(3):1024-31.
4. Tanrikut C, **Feldman AS,** Altemus M, Paduch DA, Schlegel PN. Adverse effect of paroxetine on sperm. Fertility and Sterility. 2009. June 10, Epub ahead of print.
5. Kubota K, Anjum R, Yu Y, Kunz RC, Andersen JN, Kraus M, Keilhack H, Nagashima K, Krauss S,

Paweletz C, Hendrickson RC, **Feldman AS**, Wu CL, Rush J, Villen J, Gygi SP. Sensitive multiplexed analysis of kinase activities and activity-based kinase identification. Nature Biotechnology. 2009: 27(10): 933-40.

6. Pandharipande PV, Gervais DA, Hartman RI, Harisinghani MG, **Feldman AS**, Mueller PR, Gazelle GS. Renal mass biopsy to guide treatment decisions for small incidental renal tumors: a cost-effectiveness analysis. Radiology. 2010: 256(3):836-46.
7. Coen JJ, **Feldman AS**, Smith MR, Zietman AL. Watchful waiting for localized prostate cancer in the PSA era: what have been the triggers for intervention? BJU Int. 2010 Sep 22. Epub ahead of print.
8. Psutka SP, **Feldman AS**, Rodin D, Olumi AF, Wu CL, McDougal WS. Men With Organ-confined Prostate Cancer and Positive Surgical Margins Develop Biochemical Failure at a Similar Rate to Men With Extracapsular Extension. Urology. 2011 Mar 14. [Epub ahead of print]
9. **Feldman AS,** McDougal WS. Long Term Outcome of Excisional Organ Sparing Surgery for Carcinoma of the Penis. J Urol. 2011 Oct;186(4):1303-7.
10. Fernandez CA, Milholland JM, Zwarthoff EC, **Feldman AS**, Karnes JR, Shuber AP. A noninvasive multi-analyte diagnostic assay: combining protein and DNA markers to stratify bladder cancer patients. Research and Reports in Urology. 2012 Feb 22. [EPub]
11. Gershman B, Zietman AL, **Feldman AS**, McDougal WS. Transperineal Template-Guided Prostate Biopsy for Patients with Persistently Elevated PSA and Multiple Prior Negative Biopsies. Urol Oncol. 2013 Oct;31(7):1093-7.
12. *Psutka SP, ***Feldman AS**, McDougal WS, McGovern FJ, Mueller P, Gervais DA. Long-Term Oncologic Outcomes After Radiofrequency Ablation for T1 Renal Cell Carcinoma. Eur Urol. 2013 Mar;63(3):486-92.
    *Co-first Authorship
13. Leung CP1, Klausner AP, Habibi JR, King AB, **Feldman A**. Audience response system: a new learning tool for urologic conferences. Can J Urol. 2013 Dec;20(6):7042-5.
14. Xu R, Horick N, McGovern FJ, Dahl DM, **Feldman AS**, Blute ML, Olumi AF, Michaelson MD. Prognostic significance of indeterminate lung nodules in renal cell carcinoma. Urol Oncol. 2014 Apr;32(3):355-61.
15. Sheth RA, **Feldman AS**, Walker TG. Renoduodenal Fistula After Transcatheter Embolization of Renal Angiomyolipoma. Cardiovasc Intervent Radiol. 2014 Apr 11. [Epub ahead of print]
16. Pollock CB, McDonough S, Wang VS, Lee H, Ringer L, Li X, Prandi C, Lee RJ, **Feldman AS**, Koltai H, Kapulnik Y, Rodriguez OC, Schlegel R, Albanese C, Yarden RI. Strigolactone analogues induce apoptosis through activation of p38 and the stress response pathway in cancer cell lines and in conditionally reprogramed primary prostate cancer cells. Oncotarget. 2014 Apr 2. [Epub ahead of print]
17. Yang P, Cornejo KM, Sadow PM, Cheng L, Wang M, Xiao Y, Jiang Z, Oliva E, Jozwiak S, Nussbaum RL, **Feldman AS**, Paul E, Thiele EA, Yu JJ, Henske EP, Kwiatkowski DJ, Young RH, Wu CL. Renal Cell Carcinoma in Tuberous Sclerosis Complex. Am J Surg Pathol. 2014 May 14. [Epub ahead of print]
18. Hedgire SS, Tabatabaei S, McDermott S, **Feldman A**, Dahl DM, Harisinghani MG. Diversion ahead: imaging appearance of urinary diversions and reservoirs. Clin Imaging. 2014 Jul-Aug;38(4):418-27.
19. Rodríguez D, Preston MA, Barrisford GW, Olumi AF, **Feldman AS**. Clinical features of leiomyosarcoma of the urinary bladder: Analysis of 183 cases. Urol Oncol. 2014 Oct;32(7):958-65.
20. Siddiqui MM, Heney NM, McDougal WS, Feldman AS (2015) Disparities in overall and urothelial carcinoma specific mortality associated with healthcare insurance status. Bladder 2(1):e10. doi:

10.14440/bladder.2015.39. *Accepted for publication.*

21. Ringer L, Sirajuddin P, Tricoli L, Waye S, Choudhry MU, Parasido E, Sivakumar A, Heckler M, Naeem A, Abdelgawad I, Liu X, **Feldman AS**, Lee RJ, Wu CL, Yenugonda V, Kallakury B, Dritschilo A, Lynch J, Schlegel R, Rodriguez O, Pestell RG, Avantaggiati ML, Albanese C. The induction of the p53 tumor suppressor protein bridges the apoptotic and autophagic signaling pathways to regulate cell death in prostate cancer cells. Oncotarget. 2014 Nov 15;5(21):10678-91
22. Hanske J, Sanchez A, Schmid M, Meyer CP, Abdollah F, **Feldman AS**, Kibel AS, Sammon JD, Menon M, Eswara JR, Noldus J, Trinh QD. A Comparison of 30-Day Perioperative Outcomes in Open Versus Minimally Invasive Nephroureterectomy for Upper Tract Urothelial Carcinoma: Analysis of 896 Patients from the American College of Surgeons-National Surgical Quality Improvement Program Database. J Endourol. 2015 Jun 11. [Epub ahead of print]
23. Hanske J, Sanchez A, Schmid M, Meyer CP, Abdollah F, Roghmann F, **Feldman AS**, Kibel AS, Sammon JD, Noldus J, Trinh QD, Eswara JR. Comparison of 30-day perioperative outcomes in adults undergoing open versus minimally invasive pyeloplasty for ureteropelvic junction obstruction: analysis of 593 patients in a prospective national database. World J Urol. 2015 May 13. [Epub ahead of print]
24. Huang J, **Feldman AS**, Dong L, Cornejo K, Liu Q, Dahl DM, Wu S, Blute ML, Huang Y, Wu CL. Preoperative Anemia as an Independent Prognostic Indicator of Papillary Renal Cell Carcinoma. Clin Genitourin Cancer. 2015 May 4. pii: S1558-7673
25. Rodríguez D, Cornejo KM, Sadow PM, Santiago-Lastra Y, **Feldman AS.** Myopericytoma tumor of the glans penis. Can J Urol. 2015 Jun;22(3):7830-3.
26. *Preston MA, ***Feldman AS**, Coen JJ, McDougal WS, Smith MR, Paly JJ, Carrasquillo R, Wu CL, Dahl DM, Barrisford GW, Blute MB, Zietman AI. Active surveillance for prostate cancer: need for intervention and survival. Urol Oncol. 2015 Jun 6. pii: S1078-1439
*Co-first Authorship

Other peer-reviewed publications:

1. **Feldman AS**, Bauer SB. Diagnosis and management of dysfunctional voiding. Curr Opin Pediatr. 2006;18(2):139-47.
2. **Feldman AS** and McDougal WS. Inguinal Node Dissection for Penile Carcinoma. AUA Update. 2008.
3. **Feldman AS**, McDougal WS, Harisinghani MG. The potential of nanoparticle-enhanced imaging. The Journal of Urologic Oncology, Seminar Section. 2008;26(1):65-73.
4. Kaufman DS, Shipley WU, **Feldman AS**. Bladder Cancer. The Lancet. 2009; 374(9685):239-49.
5. Eisner BH and **Feldman AS**. Nanoparticle imaging for genitourinary cancers. Cancer Biomark. 2009;5(2):75-9.
6. Siddiqui MM, **Feldman AS**. Advances in the evaluation and management of lymph node involvement in urothelial carcinoma of the bladder. Expert Rev Anticancer Ther. 2010;10(12):1855-9.
7. Kreydin EI, Barrisford GW, **Feldman AS**, Preston MA. Testicular cancer: what the radiologist needs to know. AJR Am J Roentgenol. 2013 Jun;200(6):1215-25.

Non-peer reviewed scientific or medical publications/materials in print or other media:

1. **Feldman AS**, Gargollo PC, Grocela JA. Genitourinary Trauma. In: Sheridan RL, Ed. The Trauma Handbook of the Massachusetts General Hospital. Philadelphia, PA: Lippincott Williams & Wilkins;

2004. p. 584-508.

3. **Feldman AS** and Dahl DM. , 2006. June, 2-6, 2006. Laparoscopic Radical Prostatectomy. US Oncological Disease 2006. 2006: pp. 56-58.
4. **Feldman AS**, Mueller PR, McDougal WS. Radiofrequency Ablation. In: Ahmed HU, et al. Eds. Interventional Techniques in Uro-Oncology. Oxford, UK: Wiley; 2011. p. 68-85.
5. **Feldman AS,** Hsu C, Kurtz M, Cho KC. Etiology and evaluation of hematuria in adults. In: UpToDate 19.2. June 17, 2011.
6. Psutka SP, Daha A, McGovern FM, McDougal WS, Mueller PR, Gervais D, **Feldman AS.** Complication rates increase with radiofrequency ablation of large, central renal tumors. AUA News. November 2011. p. 9-10.
7. **Feldman AS** and McDougal WS. Evolving Imaging Modalities in the Diagnosis and Staging of Penile Cancer. In: Spiess P. Ed., Penile Cancer: Diagnosis and Treatment. Springer. New York. 2013.
8. **Feldman AS,** Lee RJ, Efstathiou JE, Dahl DM, Michaelson MD, Zietman A. Cancer of the bladder, ureter, and renal pelvis. In: DeVita VT, Lawrence TS, Rosenberg SA, Eds. Cancer: Principles & Practice of Oncology, 10th edition. Lippincott, Williams and Wilkins. Baltimore, MD. 2014

Thesis

1. **Feldman AS**. Developmental Lead Exposure and Cognition. Boston, MA: Boston University School of Medicine;1996.

Abstracts, Poster Presentations and Exhibits Presented at Professional Meetings:

1. **Feldman A**, Soker S, Lu X, Atala A. Characterization of the normal expression of angiogenic markers in the rat genitourinary system. Presented at Senior Scholars Presentation Day, University of Massachusetts Medical School. 2000.
2. Soker S, Machado MG, Lu X, **Feldman A**, Atala A. Localization of VEGF and its receptors in corpus cavernosa. Presented at American Urological Association. 2000.
3. **Feldman A**, Kirley S, McDougal WS, Zukerberg LR, Wu CL. The role of cables, a putative tumor suppressor gene in urothelial carcinoma. Presented at American Urological Association, New England Section, 2002. The role of cables, a putative tumor suppressor gene in urothelial carcinoma. Presented at American Urological Association, New England Section. 2002.
4. **Feldman A**, Kirley S, McDougal WS, Zukerberg LR, Wu CL. Expression of cables, a cell cycle regulatory gene is lost in human prostate cancer and suppresses prostate cancer cell growth. Presented at American Urological Association. 2003.
5. **Feldman A**, Tang Z, Kirley S, McDougal WS, Zukerberg LR, Wu CL. Expression of cables, a cell cycle regulatory gene is lost in invasive transitional cell carcinoma of the bladder. Presented at American Urological Association. 2003.
6. **Feldman A**, Kirley S, McDougal WS, Zukerberg LR, Wu CL. The expression of cables, a cell cycle regulatory gene is progressively lost in human prostate cancer as Gleason score increases. Presented at American Urological Association. 2004.
7. **Feldman AS**, Hutchinson LM, McDougal WS, Zetter BR. Proteomic analysis of voided urine, bladder cancer tissue and cell lines for biomarker discovery in transitional cell carcinoma. Presented at the Scientific Advisory Committee Meeting, Massachusetts General Hospital. 2005.
8. **Feldman AS**, Hutchinson LM, McDougal WS, Zetter BR. Biomarker profiling and novel approach

to biomarker normalization for prostate cancer diagnosis using post-DRE voided urine specimens. Presented at the Multidisciplinary Prostate Cancer Symposium. 2005.

9. **Feldman AS**, Hutchinson LM, McDougal WS, Zetter BR. Proteomic analysis of post-DRE voided urine specimens for prostate cancer biomarker discovery. Presented at the Multidisciplinary Prostate Cancer Symposium. 2005.
10. **Feldman AS**, Gervais D, Cutie CJ, Mueller PR, McDougal WS. A comparison of nephron sparing techniques: percutaneous radiofrequency ablation (RFA) vs. open and laparoscopic partial nephrectomy. Presented at the Society of Urologic Oncology, 2005 and American Urological Association. 2006.
11. **Feldman AS**, Banyard J, Wu CL, McDougal WS, Zetter BR. Proteomic discovery and analysis of Cystatin B, a novel biomarker in transitional cell carcinoma. Presented at the American Urological Association and ASCO GU Cancer Symposium. 2007.
12. **Feldman, AS**, Gartner C, Holleman A, Daha A, Gygi SP, Stampfer MJ, Zetter BR, Smith MR. Proteomic discovery and analysis of novel biomarkers in prostate cancer. Presented at the Prostate Cancer Foundation Scientific Retreat. 2008.
13. Tanrikut C, **Feldman AS**, Altemus M, Paduch DA, Schlegel PN. Antidepressant-associated changes in semen parameters. Presented at the American Society of Reproductive Medicine. 2008.
14. Psutka SD, **Feldman AS**, Rodin D, Wu C-L, McDougal WS. Positive Surgical Margins Do Not Affect Disease Recurrence in Patients with T3a Prostate Cancer. Presented at the American Urological Association, New England Section, 2008 and American Urological Association, 2009.
15. Chapin BF, **Feldman AS**, Dahl, DM. Hydrodissection of the neurovascular bundles in laparoscopic radical prostatectomy: impact on positive surgical margins. Presented at the American Urological Association, New England Section. 2008 and American Urological Association, 2009.
16. Kubota K, Anjum R, Yu Y, **Feldman A**, Wu CL, Rush J, Villen J, Gygi S. Toward simultaneously assessing the activation state of the kinome including substrate-kinase relationship. Presented at the American Society of Mass Spectrometry, 2009.
17. Osbourne AL, Daha AK, Cutie CJ, Dahl DM, **Feldman AS.** Comparison of Laparoscopic and Open Partial Nephrectomy. A retrospective review at the Massachusetts General Hospital. Presented at the American Urological Association, New England Section, 2009.
18. Daha AK, Osbourne AL, Cutie CJ, Gervais DA, Dahl DM, **Feldman AS.** Choice of Nephron Sparing Technique correlates with change in GFR: Percutaneous Radiofrequency Ablation (RFA) vs. Open and Laparoscopic Partial Nephrectomy. Presented at the American Urological Association, New England Section, 2009.
19. Chapin BF, **Feldman AS**, Psutka SD, Dahl DM. Predictors of Post-Prostatectomy Incontinence: A Multivariate Analysis. Presented at the American Urological Association, New England Section, 2009.
20. **Feldman AS**, Jedrychowski M, Huttlin E, Gartner C, Holleman A, Gygi SP, Zetter BR, Smith MR. Proteomic discovery of novel biomarkers in prostate cancer using mass spectrometry. Presented at the Prostate Cancer Foundation Scientific Retreat. 2009.
21. Psutka SP, Daha A, Gervais D, **Feldman AS.** Salvage radiofrequency ablation achieves effective local control of recurrent renal cell carcinoma. Presented at the American Urological Association, New England Section, 2010 and Society of Urologic Oncology, 2010.
22. Psutka SP, Daha A, McGovern FM, McDougal WS, Mueller PR, Gervais D, **Feldman AS.** Radiofrequency ablation of centrally located renal tumors is associated with increased rates of Clavien grade 3-5 complications. Presented at the American Urological Association, 2011.
23. Siddiqui MM, Heney N, McDougal WS, **Feldman AS.** Private vs. public insurance: is there a

difference in survival in bladder urothelial carcinoma? Presented at the American Urological Association, New England Section, 2010 and American Urological Association, 2011.

24. Psutka SP, Daha A, Gervais D, **Feldman AS** Salvage radiofrequency ablation achieves local control of recurrent renal cell carcinoma. Presented at the Society of Urologic Oncology, 2010.
25. Deshmukh SM, Sequeira L, McGovern FJ, Dahl D, Olumi A, Eisner B, McDougal WS, Mueller P, Samir A, **Feldman AS**. Percutaneous Biopsy of Suspicious Cystic Renal Masses: What is the Diagnostic Yield? Presented at the American Urological Association, 2011.
26. Deshmukh SM, Sequeira L, McGovern FJ, Dahl D, Olumi A, Eisner B, McDougal WS, Mueller P, Samir A, **Feldman AS**. Percutaneous Renal Mass Biopsy: If they're positive, they're positive, but if they're negative, be careful: A Correlation Between Renal Biopsy and Surgical Pathology. Presented at the American Urological Association, 2011.
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